Serial No.: 10/655,350
Response Dated February 16, 2007
Reply to Office Action of September 20, 2006 136086-1

AMENDMENTS TO THE SPECIFICATION

- Please replace paragraph entitled ABTRACT OF THE DICLOSURE with the following amended paragraph:

ABSTRACT OF THE DISCLOSURE

The present invention provides a [A] deposition process for plasma enhanced chemical vapor deposition of a coating on a substrate. The process comprises determining a target process condition within a chamber of an expanding thermal plasma generator ~~for plasma enhanced chemical vapor deposition of a coating on a substrate~~; the generator comprising a cathode, a replaceable cascade plate and an anode comprising a [with] concentric orifice; and thereafter replacing the cascade plate with another plate having a configured orifice to effect the identified target process condition.[;] The ~~and generating a~~ plasma is then generated at the target process condition by providing a plasma gas to the plasma generator and ionizing the plasma gas in an arc between cathode and anode within the generator and expanding the gas as a plasma onto a substrate in a deposition chamber~~A deposition apparatus for generating a controllable plasma; comprises a deposition chamber; adapted to be maintained at subatmospheric pressure; an article support within the deposition chamber; an expanding thermal plasma generator comprising a cathode, a single cascade plate and an anode and a communicating orifice through the cascade plate, the orifice having a length of 1mm to less than 20 mm~~.

- Please replace paragraph [0025] with the following amended paragraph:

[0025] Second chamber 140 is adapted to contain an article [160] 150 that is to be treated with the plasmas produced by apparatus 100. In one embodiment, such plasma treatment of article [160] 150 comprises injecting at least one reactive gas into the plasma produced by apparatus 100 and depositing at least one coating on a surface of article [160] 150. The surface of article [160] 150 upon which the at least one plasma impinges may be either planar or non-planar. The characteristics of the plasma generated by plasma generator 102 vary according to the configuration of replaceable cascade plates [130] 122, [230,] and 222 as hereinafter described.

Apparatus 100 is capable of providing other plasma treatments in which at least one plasma impinges upon a surface of article [160] 150, such as, but not limited to, plasma etching at least one surface of article [160] 150, heating article [160] 150, lighting or illuminating article [160] 150, or functionalizing (i.e., producing reactive chemical species) on a surface of article [160] 150. The characteristics of the plasma treatment process are strongly affected by the operating parameters of the plasma generator. Among such operating parameters are the operating pressure within the plasma generator, plasma resistance, the potential across the cathode and anode, the plasma current and the cathode-to-anode distance

- Please replace paragraph [0028] with the following amended paragraph:

[0028] Reagents are supplied to the plasma through supply lines 114, 214, but it will be understood that more or fewer supply lines and associated structure elements may be present, depending on the chemistry of the desired plasma. For example, oxygen gas may be supplied through one line, zinc may be supplied through another, and indium may be supplied through still another to form an indium zinc oxide film on substrate [160] 150. Oxygen and zinc only can be supplied if a zinc oxide film is to be deposited. Illustrative depositing reagents include oxygen, nitrous oxide, nitrogen, ammonia, carbon dioxide, fluorine, sulfur, hydrogen sulfide, silane, organosilanes, organosiloxanes, organosilazanes and hydrocarbons for making oxide, nitride, fluoride, carbide, sulfide and polymeric coatings. Examples of other metals whose oxides, fluorides, and nitrides may be deposited in the same way are aluminum, tin, titanium, tantalum, niobium and cerium. Alternatively, oxygen and hexamethyldisiloxane, tetramethyidisiloxane or octamethylcyclotetrasiloxane may be supplied to form a silica-based hardcoat. Other types of coatings which can be deposited by ETP can be used.

- Please replace paragraph [0029] with the following amended paragraph:

[0029] The treated or coated substrate [160] 150 may be of any suitable material including metal, semiconductor, ceramic, glass or plastic. In a preferred embodiment, it is a thermoplastic such as polycarbonate, copolyestercarbonate, polyethersulfone,

polyetherimide or acrylic. Polycarbonate is particularly preferred; the term "polycarbonate" in this context including homopolycarbonates, copolycarbonates and copolyestercarbonates.

- Please replace paragraph [0037] with the following amended paragraph:

[0037] The characteristics (e.g., coating thickness, degree of etching or activation) of a region treated by a single plasma generator, such as an ETP generator, generally exhibit a profile having a Gaussian distribution about the axis of the plasma generator. When multiple plasma generators are used to treat article [160] 150, uniformity may be promoted by positioning the individual plasma generators such that the resulting Gaussian distributions overlap. The profile, as well as the width and height of the distributions, are dependent in part upon the characteristics of the plasmas that are used to treat the substrate. The characteristics of each of the plasmas are in turn dependent upon the conditions - such as cathode voltage, plasma gas pressure and cathode-to-anode distance (gap 110) - used to generate the plasmas within the individual plasma generators. From additional experiments in which interlayers were deposited from VTMS (described in the EXAMPLES), it was found that both deposition rate and deposition uniformity increase as length of the cylindrical straight wall increases as illustrated in FIG. 6A and FIG. 6B. In FIG. 6A, A equals area (in nm x cm) under a Gaussian Profile deposited in Static Mode. In FIG. 6B, w equals width of the Gaussian profile in cm.

- Please replace TABLE 1 with the following reformatted TABLE 1:

ex #	Design	#plates	Resistivity Ohm-cm	I/A cm-1	resistance ohms	current amps	Ar flow slpm	Voltage volts	power watts	Pressure torr
1	Fig 3a	1	0.011	7.8	0.085	70	2	6	420	700
2	Fig 3b	1	0.012	13.3	0.157	70	2	11	770	1000
3	Fig 3c	1	0.011	49.2	0.525	70	2	37	2590	>1200
4	1.8 mm straight	1	0.013	19.2	0.267	70	2	19	1330	700
5	2.0 mm straight	1	0.012	15.6	0.188	70	2	13	910	553
6	Inverted example 1	1	0.041	7.8	0.32	70	2	22.4	1568	700
7	Asymmetric orifice	1	0.036	20.0	0.733	30	2	22	660	1000
8	Expanding channel a	2	0.03	7.8	0.23	70	2	17	1190	>12000
9	2.0 mm straight	2	0.021	15.6	0.327	70	2	22	1540	770
10	2.5 mm straight	2	0.029	10	0.296	70	2	20.7	1450	437
11	Comparative Ex. 2 to 8		0.032	3.9	0.126	70	2	8.7	609	

- Please replace TABLE 2 with the following reformatted TABLE 2:

CP design	Dep Temp (C)	Thick (μm)	Taber dHaze	WI adhesion (1 to 5B)
Expanding channel a	72	2.08	4.0	5
1.8 mm straight	96	2.73	3.8	3
Exp channel a inverted	82	2.50	3.9	4

- Please replace TABLE 3 entitled SETUP OF DOE with the following reformatted TABLE 3:

Control Parameters					Responses	
Gas	Cascade	Ar Flow	VTMS flow	Current	Resulting Power	Resulting Pressure Ratio
VTMS	Double Length	2	0.15	40	1440	3.1
VTMS	Double Length	2	0.15	60	2430	3.66667
VTMS	Double Length	2	0.35	40	1376	2.14286
VTMS	Double Length	2	0.35	60	2400	3.11429
VTMS	Double Length	1	0.15	40	1224	2.16667
VTMS	Double Length	1	0.15	60	2088	2.96667
VTMS	Double Length	1	0.35	40	1228	1.71429
VTMS	Double Length	1	0.35	60	2082	2.37143
VTMS	Standard	2	0.15	40	960	2.46667
VTMS	Standard	2	0.15	60	1626	3.33333
VTMS	Standard	2	0.35	40	928	1.77143
VTMS	Standard	2	0.35	60	1602	2.57143
VTMS	Standard	1	0.15	40	832	1.8
VTMS	Standard	1	0.15	60	1416	2.33333
VTMS	Standard	1	0.35	40	836	1.42857
VTMS	Standard	1	0.35	60	1404	1.85714

- Please replace TABLE 4 with the following reformatted TABLE 4:

Term	Effect	Coef	StDev Coef	T	P
Constant		1	26.44	56.42	0.000
Cascade	-583.0	1	26.44	-11.03	0.000
Air Flow	206.5	1	26.44	3.90	0.525
VTMS flo	-20	1	26.44	-0.38	0.713
Current	778.0	1	26.44	14.71	0.000

- Please replace TABLE 5 entitled ANALYSIS OF VARIANCE FOR POWER (CODED UNITS) with the following reformatted TABLE 5:

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Main Effects	4	3952861	3952861	988215	88.32	0.000
Residual Error	11	123075	123075	11189		
Total	15	4075936				

- Please replace TABLE 5 entitled ESTIMATED EFFECTS AND COEFFICIENTS FOR PRESSURE (CODED UNITS)with the following reformatted TABLE 5:

Term	Effect	Coef	StDev Coef	T	P
Constant		2.4253	0.03360	72.18	0.000
Cascade	-0.4601	-0.2301	0.03360	-6.85	0.000
Ar Flow	0.6911	0.3455	0.03360	10.28	0.000
VTMS flo	-0.6077	-0.3039	0.03360	-9.04	0.000
Current	0.7030	0.3515	0.03360	10.46	0.000

- Please replace TABLE 6 with the following reformatted TABLE 6:

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Main Effects	4	6.2123	6.2113	1.55281	85.95	0.000
Residual Error	11	0.1987	0.1987	0.01807		
Total	15	6.4100				